BUREAU OF LAND MANAGEMENT
Alaska Fire Service

HEARING CONSERVATION PROGRAM

1.1 Purpose. The purpose of this program is to establish requirements and procedures that will eliminate, prevent, or minimize the risk of hearing impairment from exposure to excessive levels of noise in the work environment.

1.2 Scope. This program applies Statewide to all activities where excessive noise is present.

1.3 Policy. The Bureau policy is to provide a work environment which does not impair an employee's hearing.

1.4 Authority.

A. Occupational Safety and Health Act of 1970 (OSHA), Section 19, Federal Agency Safety and Health Program.

B. Executive Order 12196, Occupational Safety and Health Programs for Federal Employees.

C. 29 CFR 1910.95 - Occupational Noise Exposure.

D. 29 CFR 1910.132 - OSHA Personal Protective Equipment Standard

1.5 Responsibilities. The following responsibilities supplement those contained in BLM Safety and Health Handbook H-1112-1 Chapter 14.5 and BLM Handbook for Field Operations H-1112-2 Topic 7.4

A. The AFS Safety Manager is responsible for providing technical support to supervisors and project leaders requesting assistance in implementation of the Hearing Conservation Program.

B. Supervisors and/or Project Leaders will determine expected noise exposure and implement program requirements in accordance with guidance provided in 1.7.

C. Employees will participate in the hearing conservation program and wear hearing protection as required in this chapter.

1.6 Definitions.

A. Administrative Controls. Any procedure which limits noise exposure by control of the work schedule. The use of hearing protectors does not constitute administrative controls.

B. Attenuation. The amount of noise reduction afforded an employee by use of a hearing protector.

C. Audiometric Testing. The measuring of hearing acuity at specified sound frequencies.

D. Audiogram. A graph or table of hearing levels determined by audiometric testing.

E. Baseline Audiogram. The first BLM audiogram of record for an employee.

F. dBA (decibel A-weighted). The basic unit for the measurement of sound levels within human perception range.

G. Engineering Control. Any design modification that reduces or contains the emitted or transmitted sound level from any noise source.

H. Employee. The term includes, but is not limited to, BLM employees, cooperators, and volunteers.

I. Excessive Noise Levels. Any noise level 85 dBA and above.

J. Standard Threshold Shift. A change in hearing threshold relative to the baseline audiogram of an average of 10 dBA or more at 2000, 3000, and 4000 Hz in either ear.

1.7 Program Requirements.

A. Excessive Noise Producing Operations and Equipment.

(1) The following excessive noise producing operations and equipment require hearing protectors:

(a) Any employee engaged in operations or use of equipment of the type listed in Appendix 2 must wear hearing protectors. Employees working in close proximity to these operations or equipment may also be required to wear hearing protectors.

(b) In instances where employees and/or supervisors believe noise exposure to operations or equipment listed in Appendix 2 is below 85 dBA, actual measurement may be taken.

(2) For any other operation or equipment suspected of producing an excessive noise level, actual measurements will be taken. Further action will be in accordance with 1.7B.

(3) A record of all noise measurements will be maintained in the office of the Safety Manager.

(4) Actual noise measurements will be taken by a calibrated noise measuring instrument at the operator's ear.

B. Conservation and Controls.

(1) If the noise level is at all times below 85 dBA, engineering controls, administrative controls, and hearing conservation measures are not required.

(2) If noise exposure levels equal or exceed an 8-hour time-weighted average of 85 decibels, engineering or administrative controls are required and compulsory use of hearing protectors will apply. An audiometric testing program will also be implemented and maintained for all exposed personnel in accordance with 29 CFR 1910.95.

(3) If a change occurs that would permanently alter the noise level of any operation or piece of equipment, a new noise measurement is required.

C. Audiometric Testing Program.

(1) A baseline audiogram test shall be made available to each employee who is or will be exposed to noise equal to or exceeding a TWA level of 85 dBA or, equivalently, a total dose of fifty percent as computed using formula D = 100(C1/T1 +C2/T2 +.....+ Cn/Tn) (D=dose, C=time employee was exposed to specific noise level, T = permitted time for exposure from table G-16). The baseline audiogram will be recorded after at least 14 hours without exposure to excessive noise. The use of hearing protectors prior to the baseline audiogram may be considered non- exposure to excessive noise. The employer shall notify employees of the need to avoid high levels of non-occupational noise exposure during the 14-hour period immediately preceding the audiometric examination.

(a) The audiometric test will be administered by a certified audiologist, otolaryngologist or other physician, or technician who is certified by the Council of Accreditation in Occupational Hearing Conservation. A technician who operates microprocessor audiometers does not need to be certified. A technician who performs audiometric tests must be responsible to an audiologist, otolaryngologist or physician.

(b) The employee will be tested at the following frequencies: 500, 1000, 2000, 3000, 4000, and 6000 Hertz (Hz). Calibrated testing equipment shall be used.

(2) At least annually from the latest test or retest, as required by the examiner, a new audiogram will be obtained. An exit audiometric test is required upon termination of employment. An exit test is also required for seasonal employees (or others hired for less than 1 year) who were exposed to excessive noise levels.

(3) All audiometric records shall be routed through the authorizing safety manager to the appropriate personnel office for inclusion in the Employee Medical File. These records shall include all audiograms, related evaluations, and audiometric reports. When a standard threshold shift occurs, a copy of the audiometric report will be routed to the authorizing safety manager.

(4) Any desired follow up testing or examination will be at the employee expense unless covered by workers compensation.

D. Evaluation of audiogram

(1)Each employee's annual audiogram shall be compared to that employee's baseline audiogram to determine if the audiogram is valid and if a standard threshold shift has occurred. This comparison may be done by a technician.

(2) If the annual audiogram shows that an employee has suffered a standard threshold shift, the employer may obtain a retest within 30 days and consider the results of the retest as the annual audiogram.

(3) The audiologist, otolaryngologist, or physician shall review problem audiograms and shall determine whether there is a need for further evaluation.

(a) The employer shall provide to the person performing this evaluation the following information:

- A copy of the requirements for hearing conservation;
- The baseline audiogram and most recent audiogram of the employee to be evaluated;
- Measurements of background sound pressure levels in the audiometric test;
- Records of audiometer calibrations;

E. Follow-up Procedures.

(1) If a comparison of the annual audiogram to the baseline audiogram indicates a standard threshold shift the employee shall be informed of this fact in writing, within 21 days of the determination

(2) Unless a physician determines that the standard threshold shift is not work related or aggravated by occupational noise exposure, the employer shall ensure that the following steps are taken when a standard threshold shift occurs:

(a) Employees not using hearing protectors shall be fitted with hearing protectors, trained in their use and care, and required to use them.

(b) Employees already using hearing protectors shall be refitted and retrained in the use of hearing protectors and provided with hearing protectors offering greater attenuation if necessary.

(3) The employee could be referred for a clinical audio logical evaluation or an ontological examination, as appropriate, if additional testing is necessary or if the employer suspects that a medical pathology of the ear is caused or aggravated by the wearing of hearing protectors.

(4) The employee is informed of the need for an ontological examination if a medical pathology of the ear that is unrelated to the use of hearing protectors is suspected.

(5) If subsequent audiometric testing of an employee whose exposure to noise is less than an 8-hour TWA of 90 decibels indicates that a standard threshold shift is not persistent, the employer:
- Shall inform the employee of the new audiometric interpretation; and
- May discontinue the required use of hearing protectors for that employee.

(6) “Revised baseline." An annual audiogram may be substituted for the baseline audiogram when, in the judgment of the audiologist, otolaryngologist or physician who is evaluating the audiogram determines the standard threshold shift revealed by the audiogram is persistent; or the hearing threshold shown in the annual audiogram indicates significant improvement over the baseline audiogram.

(7) “Standard threshold shift” is a change in hearing threshold relative to the baseline audiogram of an average of 10 dB or more at 2000, 3000, and 4000 Hz in either ear.

F. Audiometric test requirements.

(1) Audiometric tests shall be pure tone, air conduction, hearing threshold examinations, with test frequencies including as a minimum 500, 1000, 2000, 3000, 4000, and 6000 Hz. Tests at each frequency shall be taken separately for each ear.

(2) Audiometric tests shall be conducted with audiometers (including microprocessor audiometers) that meet the specifications of, and are maintained and used in accordance with, American National Standard Specification for Audiometers, S3.6-1969.

(3) Pulsed-tone and self-recording audiometers, if used, shall meet the requirements specified in 29 CFR 1910.95, Appendix C: "Audiometric Measuring Instruments."

G. Audiometric Test Rooms.

Rooms used for audiometric testing shall not have background sound pressure levels exceeding those listed below.

TABLE D-1 - MAXIMUM ALLOWABLE OCTAVE-BAND SOUND PRESSURE LEVELS FOR AUDIOMETRIC TEST ROOMS

Octave-band center frequency (Hz)	500	1000	2000	4000	8000
Sound pressure level (dB)	40	40	47	57	62

H. Acoustic calibration of audiometers.

Audiometer calibration shall be checked acoustically, at least annually, according to the procedures described in this appendix. The equipment necessary to perform these measurements is a sound level meter, octave-band filter set, and a National Bureau of Standards 9A coupler. In making these measurements, the accuracy of the calibrating equipment shall be sufficient to determine that the audiometer is within the tolerances permitted by American Standard Specification for Audiometers, S3.6-1969.

I. Calculations and application of age corrections to audiograms.

In determining whether a standard threshold shift has occurred, allowance may be made for the contribution of aging to the change in hearing level by adjusting the most recent audiogram. This procedure and the age correction tables were developed by the National Institute for Occupational Safety and Health in the criteria document entitled "Criteria for a Recommended Standard Occupational Exposure to Noise," (HSM)-11001).

(1) For each audiometric test frequency;

(a) Finding the age at which the most recent audiogram was taken and recording the corresponding values of age corrections at 1000 Hz through 6000 Hz;

(b) Finding the age at which the baseline audiogram was taken and recording the corresponding values of age corrections at 1000 Hz through 6000 Hz.

(c) Subtract the values found in step (B) from the value found in step (A).

(d) The differences calculated in step (c) represented that portion of the change in hearing that may be due to aging.

EXAMPLE: Employee is a 32-year-old male. The audiometric history for his right ear is shown in decibels below.

Employee's age	Audiometric test frequency (Hz)				
	1000	2000	3000	4000	6000
26	10	5	5	10	5
*27	0	0	0	5	5
28	0	0	0	10	5
29	5	0	5	15	5
30	0	5	10	20	10
31	5	10	20	15	15
*32	5	10	10	25	20

The audiogram at age 27 is considered the baseline since it shows the best hearing threshold levels. Asterisks have been used to identify the baseline and most recent audiogram. A threshold shift of 20 dB exists at 4000 Hz between the audiograms taken at ages 27 and 32.
(The threshold shift is computed by subtracting the hearing threshold at age 27, which was 5, from the hearing threshold at age 32, which is 25). A retest audiogram has confirmed this shift. The contribution of aging to this change in hearing may be estimated in the following manner: Go to Table F-1 and find the age correction values (in dB) for 4000 Hz at age 27 and age 32.

	Frequency (Hz)				
	1000	2000	3000	4000	6000
Age 32	6	5	7	10	14
Age 27	5	4	6	7	11
Difference	1	1	1	3	3

The difference represents the amount of hearing loss that may be attributed to aging in the time period between the baseline audiogram and the most recent audiogram. In this example, the difference at 4000 Hz is 3 dB. This value is subtracted from the hearing level at 4000 Hz, which in the most recent audiogram is 25, yielding 22 after adjustment. Then the hearing threshold in the baseline audiogram at 4000 Hz (5) is subtracted from the adjusted annual audiogram hearing threshold at 4000 Hz (22). Thus the age-corrected threshold shift would be 17 dB (as opposed to a threshold shift of 20 dB without age correction).

J. Hearing Protectors.

(1) The two major types of hearing protectors are muffs and earplugs. Each type of hearing protector is rated by the manufacturer as to its attenuation value. When selecting hearing protectors, the attenuation value provided by the manufacturer of the protectors must be not less than 22 dBA. See Appendix 1 for protection selection criteria.

(2) Hearing protectors will be provided and their use required by visitors or others exposed to excessive noise producing operations or equipment.

K. Caution Signs.

On equipment and at entrances or in areas where employees may be exposed to noise levels in excess of 85 dBA, clearly worded caution signs shall be posted.

Appendix 1, Table G-16 Permissible Noise Exposures.

Appendix 2, Excessive Noise Producing Operations and Equipment

Appendix 3, Sample decibel levels of Fire Related Equipment

Appendix 4, Age Correction Values

Appendix 5, General Hearing Conservation Information

Appendix 1

Table G-16 Permissible Noise Exposures

Duration per day (hours)	Sound level dBA slow response
8	90
6	92
4	95
3	97
2	100
11/2	102
1	105
½	110
1/4 or less	115

Exposure to impulsive or impact noise should not exceed 140 dB peak sound pressure level.

29 CFR 1910.95(b)
(b) (1) When employees are subjected to sound exceeding those listed in Table G-16, feasible administrative or engineering controls shall be utilized. If such controls fail to reduce sound levels within the levels of Table G-16, **personal protective equipment shall be provided and used to reduce sound levels within the levels of the table.**

Noise Reduction Rating(NRR) for hearing protection device (EPA requires the NRR on the package).

Subtract 7 from the NRR

Subtract the remainder from the dB of exposure in Table G to determine **Duration of Exposure Allowable per day**.

EXAMPLE

Exposure is 115 dB

NRR = **29**-7 = 22
115-22 = 93
Table G for 93 dB = **4+** hrs per day with this NRR

NRR = **33**-7 = 26
115-26 = 89
Table G for 89 dB = **8** hrs per day with this NRR

Appendix 2

Excessive Noise Producing Operations and Equipment**

Measurements taken at the Employee Point of Operations or Working Proximity

Forklift, Yale	90 dB
Table Saw	110-115 dB
Router	110-115 dB
Band Saw	100 dB
Hand Power Saw	110-115 dB
Planner	110-115 dB
Chop-Saw	90-95 dB
Power Drill	95 dB
Stihl Chain saw	110 dB
Grinder	100-110 dB
Steam Cleaner	95 dB
Fuel Transfer Pump, Marlow	95 dB
Rock Drill	120 dB
Helicopter B-206*	110-115 dB (Outside 1 to 50 feet)
"	90-100 dB (Inside)
Turbine Aircraft-Caravan*	110-115 dB
Road Grader	90-95 dB
Riding Mower	95-100 dB
Weed Trimmer, Gas	95-100 dB
Front End Loader	90-95 dB
Outboard-Tiller 40hp Yamaha	95-100 dB
Shotgun 12 GA.	140 dB

***Wear hearing PPE whenever working around any running aircraft regardless of model.**

****This is a representative list and not necessarily particular to makes or models. Hearing PPE should be used when ever operating power tools or equipment.**

Appendix 3

Noise Levels/Fire Related Equipment

The place to begin a hearing program is to establish the noise exposures that employees are receiving while performing their daily work. We have surveyed several work sites and taken readings from many of the pieces of power equipment used by employees through out the region. You may use this information as a guide to help determine the need and level of hearing protection required for various jobs using this equipment. The Health and Safety Code Handbook requires hearing protection while operating any piece of mechanical equipment that produces noise levels in excess of 85db.

Chain Saw readings where taken at the operators ear and in a forested area while starting and during operation.

Chain Saws		**Idle**	**Operational**
Stihl	019	90db	100-104db
"	026	94db	98-102db
"	034	94db	100-105db
"	038	96db	104-106db
"	044	90db	104-108db
"	046	96db	104-108db
"	076	94db	104-108db
Husquvarna	371xp	94db	94-116db
"	281	94db	100-108db
"	394	94db	102-108db
Stihl Chain Grinder (electric)		70db	92-96db
Bar Grinder (electric)		72db	82-96db

Other-Gas-Powered-Tools	**Idle**	**Operational**
Sthil 081 Brush Cutter	84db	98-102 db
Sthil 320 Leaf Blower	86db	95-105db
Sthil TS 510 AV concrete cutter	95db	105-112db
Marx 3 pump	96db	110-115db
Marx 26 pump	96db	107-109db
Homelite 3 inch volume pump	95db	99-101db
BB4 volume pump 16hp	90db	103-106db

Shop Tools

Black & Decker 71/4” circular saw	100-102db
Porter Cable 6” circular saw	96-104db
Porter Cable router	98-100db
Skill biscuit jointer	96-98db
Ryobi biscuit jointer	94-98db
Rockwell miter saw	106-108db
Black & Decker grinder (hand held)	92-104db
Shop Vac	92-94db
Rockwell table saw	86-92db
Dewalt band saw	88-94db
Dremel tool	72-90db

Vehicles	**Idle**	**Operation**
Forest Service Fire patrol (*Average from Several Makes*)	70db	80-85db
Windows closed		
Driven Window Open		85-90db
Outside With Pump Running		90-105db
Water Tender (*Average From Different Makes*)	80-85db	90-95db

Equipment (*Readings Taken in Cab With Doors And Windows Closed*)	**Idle**	**Operation**
John Deere Grader	76db	88db
“ “ Front End Loader	70db	78db
New Holland Brush Cutter	70db	78-80db
Case International Tractor 895	80db	82-92db
Bobcat Loader (*Open Cab*)	82db	95-100db
Yale Forklift	78db	94-98db
Riding Mower (*Average Different Makes*)	75-80db	90-100db
Hand Mower (*Average Different Makes*)	75-78db	85-90db

Appendix 4

Age Correction Values

AGE CORRECTION VALUES IN DECIBELS FOR MALES

Years	Audiometric Test Frequency (Hz)				
	1000	2000	3000	4000	6000
20 or younger.....	5	3	4	5	8
21	5	3	4	5	8
22	5	3	4	5	8
23	5	3	4	6	9
24	5	3	5	6	9
25	5	3	5	7	10
26	5	4	5	7	10
27	5	4	6	7	11
28	6	4	6	8	11
29	6	4	6	8	12
30	6	4	6	9	12
31	6	4	7	9	13
32	6	5	7	10	14
33	6	5	7	10	14
34	6	5	8	11	15
35	7	5	8	11	15
36	7	5	9	12	16
37	7	6	9	12	17
38	7	6	9	13	17
39	7	6	10	14	18
40	7	6	10	14	19
41	7	6	10	14	20
42	8	7	11	16	20
43	8	7	12	16	21
44	8	7	12	17	22
45	8	7	13	18	23
46	8	8	13	19	24
47	8	8	14	19	24
48	9	8	14	20	25
49	9	9	15	21	26
50	9	9	16	22	27
51	9	9	16	23	28
52	9	10	17	24	29
53	9	10	18	25	30
54	10	10	18	26	31
55	10	11	19	27	32
56	10	11	20	28	34
57	10	11	21	29	35
58	10	12	22	31	36
59	11	12	22	32	37
60 or older	11	13	23	33	38

AGE CORRECTION VALUES IN DECIBELS FOR FEMALES

Years	Audiometric Test Frequency (Hz)				
	1000	2000	3000	4000	6000
20 or younger.....	7	4	3	3	6
21	7	4	4	3	6
22	7	4	4	4	6
23	7	5	4	4	7
24	7	5	4	4	7
25	8	5	4	4	7
26	8	5	5	4	8
27	8	5	5	5	8
28	8	5	5	5	8
29	8	5	5	5	9
30	8	6	5	5	9
31	8	6	6	5	9
32	9	6	6	6	10
33	9	6	6	6	10
34	9	6	6	6	10
35	9	6	7	7	11
36	9	7	7	7	11
37	9	7	7	7	12
38	10	7	7	7	12
39	10	7	8	8	12
40	10	7	8	8	13
41	10	8	8	8	13
42	10	8	9	9	13
43	11	8	9	9	14
44	11	8	9	9	14
45	11	8	10	10	15
46	11	9	10	10	15
47	11	9	10	11	16
48	12	9	11	11	16
49	12	9	11	11	16
50	12	10	11	12	17
51	12	10	12	12	17
52	12	10	12	13	18
53	13	10	13	13	18
54	13	11	13	14	19
55	13	11	14	14	19
56	13	11	14	15	20
57	13	11	15	15	20
58	14	12	15	16	21
59	14	12	16	16	21
60 or older	14	12	16	17	22

Appendix 5

General Hearing Conservation Information

WHAT IS THE PURPOSE OF NOISE MONITORING?

The OSHA occupational noise exposure regulation requires that employees be placed in a hearing conservation program if they are exposed to average noise levels of 85 dB or greater during an 8 hour workday. In order to determine if exposures are at or above this level, it may be necessary to measure or monitor the actual noise levels in the workplace and to estimate the noise exposure or "dose" received by employees during the workday.

WHEN IS IT NECESSARY TO IMPLEMENT A NOISE MONITORING PROGRAM?

Noise monitoring or measuring must be conducted only when exposures are at or above 85 dB. Factors which suggest that noise exposures in the workplace may be at this level include employee complaints about the loudness of noise, indications that employees are losing their hearing, or noisy conditions which make normal conversation difficult. The employer should also consider any information available regarding noise emitted from specific machines. In addition, actual workplace noise measurements can suggest whether or not a monitoring program should be initiated.

HOW IS NOISE MEASURED?

Basically, there are two different instruments to measure noise exposures: the sound level meter and the dosimeter. A sound level meter is a device that measures the intensity of sound at a given moment. Since sound level meters provide a measure of sound intensity at only one point in time, it is generally necessary to take a number of measurements at different times during the day to estimate noise exposure over a workday. If noise levels fluctuate, the amount of time noise remains at each of the various measured levels must be determined.

To estimate employee noise exposures with a sound level meter it is also generally necessary to take several measurements at different locations within the workplace. After appropriate sound level meter readings are obtained, people sometimes draw "maps" of the sound levels within different areas of the workplace. By using a sound level "map" and information on employee locations throughout the day, estimates of individual exposure levels can be developed. This measurement method is generally referred to as "area" noise monitoring.

A dosimeter is like a sound level meter except that it stores sound level measurements and integrates these measurements over time, providing an average noise exposure reading for a given period of time, such as an 8-hour workday. With a dosimeter, a microphone is attached to the employee's clothing and the exposure measurement is simply read at the end of the desired time period. A reader may be used to read-out the dosimeter's measurements. Since the dosimeter is worn by the employee, it measures noise levels in those locations in which the employee travels. A sound level meter can also be positioned within the immediate vicinity of the exposed worker to obtain an individual exposure estimate. Such procedures are generally referred to as "personal" noise monitoring.

Area monitoring can be used to estimate noise exposure when the noise levels are relatively constant and employees are not mobile. In workplaces where employees move about in different areas or where the noise intensity tends to fluctuate over time, noise exposure is generally more accurately estimated by the personal monitoring approach.

In situations where personal monitoring is appropriate, proper positioning of the microphone is necessary to obtain accurate measurements. With a dosimeter, the microphone is generally located on the shoulder and remains in that position for the entire workday. With a sound level meter, the microphone is stationed near the employee's head, and the instrument is usually held by an individual who follows the employee as he or she moves about.

Manufacturer's instructions, contained in dosimeter and sound level meter operating manuals, should be followed for calibration and maintenance. To ensure accurate results, it is considered good professional practice to calibrate instruments before and after each use.

HOW OFTEN IS IT NECESSARY TO MONITOR NOISE LEVELS?

When there are significant changes in machinery or production processes that may result in increased noise levels, re-monitoring must be conducted to determine whether additional employees need to be included in the hearing conservation program. Many companies choose to re-monitor periodically (once every year or two) to ensure that all exposed employees are included in their hearing conservation programs.